

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

Improvements in and relating to Terephthalic Acid Ester Compositions and the use thereof in Coating Conductors

We, SCHENECTADY VARNISH COMPANY, INC., a Corporation organised under the laws of the State of New York, of Congress Street and Tenth Avenue, Schenectady, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the preparation of polymeric polyhydric alcohol esters of terephthalic acid suitable for use in wire enamels and to electrical conductors coated with such esters.

Polymeric ethylene terephthalate has been proposed as an insulant for electrical conductors. However, it is difficult to dissolve polymeric ethylene terephthalate of sufficiently high molecular weight for use as an insulant in solvents. This, necessarily, renders more difficult the problem of coating of the conductor.

It has also been proposed to coat electrical conductors with a solution of a polymeric ester of glycerine or pentaerythritol with terephthalic acid which has been prepared in the presence of a water immiscible solvent taken from the group consisting of tertiary amines, dialkyl amides, ketones and esters of fatty acids and certain esters and ethers of ethylene glycol and polyethylene glycol. However, the solvents employed are relatively expensive. Moreover, completely satisfactory wire enamels have not been obtained by such a process. If the polyester is modified by a silicone, there is improved adhesion and flexibility, but, again, the final product leaves something to be desired.

A further suggestion has been made to replace part of the terephthalic acid by certain aliphatic dicarboxylic acids, but this method also is not a complete solution to the problem.

The present invention provides a superior

wire enamel composition including a polymeric ester of terephthalic acid with a polyhydric alcohol and a metal drier.

This invention also provides a wire having a coating of a polymer of an ester of terephthalic acid with a polyhydric alcohol and a metal drier which is substantially free of other polymers, but still exhibits good flexibility and adherence to the wire.

This invention improves the abrasion resistant properties of wire enamels containing a polymeric ester of terephthalic acid with a polyhydric alcohol and a metal drier.

In addition this invention improves the smoothness and coherence of such terephthalic acid-polyhydric alcohol ester enamel coatings on wires.

Furthermore this invention makes it possible to reduce the number of passes of a wire through a terephthalic acid-polyhydric alcohol enamel necessary to apply a coating of a given thickness.

It has now been found that the foregoing desired objectives can be attained by reacting glycerine or pentaerythritol with terephthalic acid or a lower alkyl ester thereof, e.g., methyl, ethyl, propyl, butyl, amyl and hexyl terephthalates, or an acyl halide thereof, e.g., terephthalic acid dichloride in the presence of cresol as a solvent, and incorporating a metal drier therewith. In some instances, it has been found desirable to add ethylene glycol as a modifying agent. While it is not essential to use an esterification catalyst, it is frequently desirable to do so. Conventional catalysts, such as hydrochloric acid, toluene sulfonic acid and litharge can be used. The preferred catalyst is litharge.

In the preferred mode of reaction, glycerine with or without ethylene glycol is condensed with dimethyl terephthalate. For each 776 grams (4 mols) of dimethyl terephthalate, there are employed 75 to 350 grams of glycerine and 0 to 350 grams of ethylene glycol. The total of the ethylene glycol and

the glycerine employed, however, should be sufficient that there is at least one hydroxyl group available for each carboxyl (COO) group. Preferably, there are present a total of 1.0 to 1.6 available hydroxyl groups in the polyhydric alcohol for each carboxyl group in the terephthalic acid or derivative thereof.

When employing a mixture of ethylene glycol and glycerine, there are preferably employed for every 776 grams of dimethyl terephthalate 100 to 200 grams of ethylene glycol and correspondingly from 200 to 100 grams of glycerine.

As previously stated, the glycerine can be partially or completely replaced by pentaerythritol. In such case, the pentaerythritol should be used in an amount to make available the same number of hydroxyl groups as when glycerine is employed. The pentaerythritol has been found especially advantageous in replacing the glycerine in whole or in part in compositions containing ethylene glycol. Pure pentaerythritol or alternatively commercial mixtures, such as a mixture of 90% pentaerythritol and 10% dipentaerythritol, commercially available as Pentek (Registered Trade Mark), can be used.

There may be used up to two parts of ethylene glycol per part of glycerine or pentaerythritol or per part of mixed glycerine and pentaerythritol.

As previously stated, the solvent employed is cresylic acid. Generally, the cresylic acid has a boiling range of 200 to 220°C., e.g., about 205°C. Cresylic acid is defined in Bennett's Concise Chemical and Technical Dictionary (1947), as a mixture of o-, m-, and p-cresols having a boiling range of 185° to 230°C.

In place of cresylic acid, the individual cresols, e.g., para cresol, can be employed, but it is preferred to use the commercial cresylic acid mixture.

It is frequently desirable to dilute the cresylic acid with a heavy coal tar or petroleum naphtha. The naphtha can be employed in an amount of from 0 to 60%, e.g., 5 to 60%, based on the total weight of the solvent mixture. Cresylic acid is the better solvent insofar as solvent power is concerned, but the naphtha improves the smoothness of the coated wire. Preferably, the naphtha is added after the polyester has reached the desired stage of reaction, as indicated by viscosity determinations. However, the naphtha can be added earlier if desired. Various conventional naphthas, especially high boiling naphthas, can be employed, such as EW naphtha (an enamel wire heavy coal tar naphtha sold by the Barrett Division of Allied Chemical and Dye Corporation) and Solvesso (Registered Trade Mark) No. 100, an aromatic naphtha de-

rived from petroleum.

The temperature of reaction is not especially critical and temperatures conventionally employed in preparing glycerine or ethylene glycol esters of terephthalic acid are used, 70 e.g., from 80°C. to reflux temperature for the solvent.

The reaction can be carried out either as a one-stage or as a multi-stage process. Preferably, the reaction is carried out as a two-stage process. The dimethyl terephthalate is reacted with the glycerine with or without ethylene glycol, in cresylic acid until a predetermined intermediate viscosity is reached and then additional cresylic acid is added and the reaction continued until the final desired viscosity is attained. The proportions of cresylic acid to reactants are not especially critical, although significant amounts of cresylic acid, e.g., at least one part per ten parts of dimethyl terephthalate should be employed in the first stage.

In general, the reaction is continued until the product has a viscosity in cresylic acid of 4000 to 5000 centipoises, measured at 25°C. (room temperature) and at 20 to 40% solids concentration. Preferably, the reaction is carried out until the polyester has a Gardner-Holt viscosity of Z<sub>1</sub> at 40% solids concentration in cresylic acid at room temperature.

When a two-step reaction is employed, preferably the heating in the first step is carried out until a sample taken from the reaction mixture and reduced to a 40% solids content with cresylic acid shows a viscosity of 2000 to 3000 centipoises, measured at 25°C. The reaction is then continued in a vacuum after addition of further cresylic acid or cresylic acid and naphtha (or if desired without such addition) until a sample of the product, reduced to a 25% solids content, has a viscosity of 50 to 100 centipoises, measured at 25°C. The amount of naphtha may be an effective amount up to 60%, by weight based on the total of the cresylic acid and naphtha.

The solution of the polymeric terephthalic acid ester in cresylic acid, with or without the naphtha, can be applied to wire, e.g., copper wire, by either of two methods conventionally employed in the wire enamelling art. For example, it can be reduced in viscosity and solids content by using a mixture of cresylic acid and EW naphtha and run by the "free dip" method. In this method, the resin solution is thinned to a viscosity of about 50 to 100 centipoises, or less, at 25°C. and the copper wire run over a pair of half-submerged pulley wheels in a tank containing the thinned solution. Alternatively, the polyester can be used at a viscosity of 400 to 500 centipoises (25°C.) and used as a die application wire enamel. The resin solution also runs very well by the

die application at 50 to 100 centipoises. The wire coated in either of these processes is then baked in a wire enamelling oven at conventional temperatures above the boiling point of the solvent, e.g., 350°C. to 450°C., to complete the polymerization of the resin and to remove the solvent.

In the following examples and throughout this specification and claims, all parts are parts by weight, unless otherwise specified.

#### EXAMPLE 1

776 grams (4.0 mols) of dimethyl terephthalate, 347 grams (3.77 mols) glycerine, 0.2 grams of litharge and 500 grams of cresylic acid were placed in a reactor fitted with an agitator, thermometer, and a short air-cooled column connected to a distillation condenser. The reactor was heated to 177°C. at which temperature the agitator was started. The temperature was raised gradually over a period of 4 hours, until a temperature of 227°C. was obtained. During this time, there was a steady distillation of methanol from the reaction vessel. The reaction was held at a temperature of 227°C. for 6 hours, at which time a sample taken from the reaction mixture, reduced to a 25% solids content with cresylic acid, showed a viscosity of 4000 to 5000 centipoises, measured at 25°C. Three hundred and sixty grams of cresylic acid were then added to the reaction vessel and the temperature of the reaction was held at 216°C. until a sample taken from the reaction, reduced to a 20% solids content with cresylic acid, showed a viscosity of 4000 to 5000 centipoises, measured at 25°C. The heating was then stopped and the reaction product was reduced with a mixture of cresylic acid and EW naphtha until the viscosity of the solution was 4000 to 5000 centipoises, measured at 25°C. The amount of EW naphtha used was such that it constituted approximately 20% of the total solvent.

The final product of Example 1, having a viscosity of 4000 to 5000 centipoises and including 20% of EW naphtha in the cresylic acid-naphtha solvent mixture, was used directly as a die application wire enamel. When applied to No. 18 A.W.G. copper wire, it was run in a 3.7 metre wire enamelling oven with a peak temperature of 399°C. at speeds of 5 to 7 metres, e.g., 6 metres per minute to give a completely satisfactory coated wire.

Another sample of the wire was treated by the free dip method with the final product of Example 1, which had been further diluted with a cresylic acid-EW naphtha mixture (20% naphtha) to a viscosity of 50 to 100 centipoises. The coated wire was then baked at 399°C. at a speed of about 6 metres per minute in a 3.7 metre oven to give the final coated wire.

In Example 1, the final product, before dilution, also was diluted to a viscosity of 4000 to 5000 centipoises at 25°C. with straight cresylic acid rather than a mixture of cresylic acid and naphtha. This product was suitable for use as a die application wire enamel. When the product was further diluted with straight cresylic acid to a viscosity of 50 to 100 centipoises at 25°C., it was capable of application by the free dip method.

#### EXAMPLE 2

776 grams (4.0 mols) of dimethyl terephthalate, 100 grams (1.62 mols) of ethylene glycol, 250 grams (2.72 mols) of glycerine, 0.2 grams of litharge and 500 grams of cresylic acid were placed in the reactor of Example 1. The reactor was heated to 177°C. and the agitator started. Over a period of 4 hours, the reactor was heated gradually to 227°C. with distillation of the methanol formed. The reactor was held at 227°C. for 12 hours, whereupon the viscosity of a sample reduced to 25% solids with cresylic acid was 4000 to 5000 centipoises at 25°C. Then, 360 grams of cresylic acid were added and the reactor was held at 216°C. for 20 hours, at which time the viscosity of a sample reduced to 20% solids with cresylic acid was 4000 to 5000 centipoises at 25°C. The resin was thinned with cresylic acid and EW naphtha to a viscosity of 4000 to 5000 centipoises at 25% solids. The naphtha constituted 20% of the total solvent.

The final product of Example 2 was applied to No. 18 A.W.G. copper wire under exactly the same conditions as the product of Example 1 by both the free dip and the die application methods.

#### EXAMPLE 3

776 grams (4.0 mols) of dimethyl terephthalate, 190 grams (3.06 mols) of ethylene glycol, 200 grams (2.18 mols) of glycerine, 0.2 grams of litharge, and 500 grams of cresylic acid were placed in the reactor of Example 1. The reactor was heated to 177°C. and the agitator started. Over a period of 4 hours, the reactor was heated gradually to 227°C. with distillation of the methanol. The reactor was held at 227°C. for 2 hours, at which time the viscosity of a sample, reduced to 37% solids with cresylic acid, was 4000 to 5000 centipoises at 25°C. Then, cresylic acid and EW naphtha were added till the viscosity was 40 to 60 centipoises at 25°C. The proportion of cresylic acid and EW naphtha in the final wire enamel was 50% of each.

#### EXAMPLE 4

In another experiment, the process of Example 3 was repeated. However, in this case, it required 4 hours heating at 227°C. to obtain a product, a sample of which, when reduced to 37% solids with cresylic acid,

had a viscosity of 4000 to 5000 centipoises at 25°C.

The products of Examples 3 and 4 were each reduced to 40 to 60 centipoises by replacing the EW naphtha by the same amount of Solvesso No. 100 to give a fully comparable composition. The reduced products of Examples 3 and 4 were used to coat copper wire by the free dip method, using the same baking conditions as in Example 1.

#### EXAMPLE 5

A good wire enamel was also obtained in the following manner. 776 grams of dimethyl terephthalate, 347 grams of glycerine, 0.2 gram of litharge and 100 grams of cresylic acid. The reactor was heated to 177°C. and then raised to 260°C. over a period of 4 hours. A vacuum was then applied (20 mm. pressure) for 15 minutes at 260°C. At this time, a sample, taken from the reaction mixture, had a Gardner-Holt viscosity of Z<sub>1</sub> (about 4630 centipoises) at 30% solids in cresylic acid at 25°C. The heating was then stopped and half of the reaction product was reduced with a mixture of cresylic acid and EW naphtha until the viscosity of the solution was 4000 to 5000 centipoises, measured at 25°C. and 20% solids concentration. The EW naphtha was used in an amount of about 50% of the total solvent. This composition was suitable for use as a die application wire enamel. The remainder of the reaction product was reduced to a viscosity of 50 to 85 centipoises, measured at 25°C. by the addition of a mixture of cresylic acid and EW naphtha to form a composition suitable for the free dip method of application to copper wire. The naphtha was used in an amount of about 50% of the total solvent.

#### EXAMPLE 6

Example 5 was repeated, but the glycerine was replaced by a mixture of 250 grams of glycerine and 100 grams of ethylene glycol. The vacuum treatment was carried out for a short time at 260°C. until the resin had a Gardner-Holt viscosity of Z<sub>1</sub> at 30% solids in cresylic acid at 25°C.

The vacuum treatment method of Examples 5 and 6 does not give as high a molecular weight product as does the process of the prior examples in which larger amounts of cresylic acid are employed during the heating. In general, in the vacuum method, the mercury pressure can vary between 16 mm. and 100 mm.

As previously set forth, the glycerine in any of the preceding examples can be replaced by pentaerythritol. The pentaeryth-

ritol can be used in the same molar amount as the glycerine or, alternatively, there can be used an additional 10% of pentaerythritol on a molar basis to account for the difference in available hydroxyl groups. Instead of pure pentaerythritol, impure mixtures, containing small amounts of dipentaerythritol, such as Pentek, for example, can be employed.

It has been further found that the addition of small amounts of zinc, lead, calcium or cadmium compounds materially improves the abrasion properties of the enamel. There can be used the usual zinc, lead, calcium or cadmium driers, such as the linoleates and resinates of each of these metals, e.g., zinc resinate, cadmium resinate, lead linoleate and calcium linoleate. However, it has been found preferable to employ the naphthenates, specifically zinc naphthenate, lead naphthenate, calcium naphthenate, and cadmium naphthenate.

Other metal driers specifically polyvalent metal driers, such as manganese naphthenate and cobalt naphthenate, can also be employed, although the zinc, lead, calcium and cadmium naphthenates, as previously stated, are preferred.

The metal compound is preferably used in an amount between 0.2% and 0.8% metal based on the total solids of the enamel. For example, to the enamel of Example 3 there can be added cadmium naphthenate in an amount to give 0.5% of cadmium based on the total solids.

Similarly, to the enamel of Example 5 there can be added zinc naphthenate in an amount to give 0.5% of zinc based on the total solids or corresponding lead naphthenate in an amount to give 0.5% of lead based on the total solids or calcium naphthenate in an amount to give 0.5% calcium based on the total solids.

The enamels of the present invention, both with and without the addition of the metal drier, have outstanding resistance to high temperatures, thus enabling them to be used as Class B insulation. A comparison of the properties of the enamels on the wire made in accordance with the present invention, in contrast to the results obtained when employing a commercial Formvar (Registered Trade Mark) (polyvinyl formal) enamel, is given in Table I below.

While the invention is especially applicable to the coating of electrical conductors in the form of wire, it can be applied to electrical conductors other than wire, e.g., terminals.

TABLE I

	Abrasion (1)	Complete- ness of Cure Passes	Elongation to Break Passes	Heat Shock at 175°C. Fails	Dielectric Strength 3,000 Volts/Mil	Heat Aging 168 hours at 125°C.	Cut-Through Temp. (2) 170°C.	
5 Formvar Enamel	30-50	Passes	Passes	Passes 3XM	3,000 Volts/Mil	2,000 hours at 175°C.	225-240°C.	5
Polyester Wire Enamel (of Example 1)	10-30	Passes	Passes	Passes 3XM	3,000 Volts/Mil	2,000 hours at 175°C.	225-240°C.	10
10 Polyester Wire Enamel + Zn naphthenate (made in accordance with Example 7)	50-60	Passes	Passes	Passes 3XM	3,000 Volts/Mil	2,000 hours at 175°C.	225-240°C.	15
15	(1) Measured on a General Electric Scrape Abrasion Tester. (2) Modified JAN-W-583. This is a standard test described in the joint United States Army-Navy Specification Wire, Magnet, dated April 7, 1948. The modification was to use a 3°C. per minute temperature rise rather than the 1°C. per two minutes in the original specification.							20

From Table I it is evident that the addition of the zinc compound materially increased the abrasion resistance.

The zinc naphthenate-polyester wire enamel composition in the above Table I was made in the following manner:

#### EXAMPLE 7

To the final product of Example 1, having a viscosity of 4000 to 5000 centipoises and including 20% of EW naphtha in the cresylic acid-naphtha solvent mixture, there was added sufficient zinc naphthenate to give 0.8% zinc, based on the total solids of the enamel and the mixture was used directly as a die application wire enamel.

In Example 7, the amount of zinc present could be varied between 0.6% and 1.0%, based on the solids of the enamel with equal success. The zinc naphthenate and the other driers mentioned could also be used in any of the other examples in both the free dip and the die application procedures.

It has additionally been found that the novel polymeric glyceryl terephthalate and pentaerythritol terephthalate ester compositions, whether or not modified by ethylene glycol, can be still further improved in giving smoother, more coherent coatings, especially on fine size wires, e.g., in the size range of 25 A.W.G. to 45 A.W.G., by adding certain phenol-formaldehyde resins to the composition. The use of the phenol-formaldehyde resin also has the further advantage that the same thickness of enamel coating can be obtained on the wire with few passes through the enamel solution in the free dip method. For example, a thickness of enamel which would require 10 coats of the enamels mentioned in any of Examples 1 to 7 can be obtained with 6 coats if the enamels are modified with a phenol-formaldehyde resin of the type set forth below.

The phenol-formaldehyde resins which can be used in the improved form of the

invention are made by reacting 0.7 to 0.95 mols of formaldehyde (in the form of aqueous formaldehyde, trioxane or para-formaldehyde) with 1 mol of a phenol, such as phenol per se, m-cresol, p-cresol, 3,5 xylenol, or 2,5 xylenol, commercial mixtures of such phenols as cresylic acid, meta-para cresol or mixed xylenols, can be used. Preferably, the phenol employed is alkylated, having 7 to 8 carbon atoms, and the resin should also be cresylic acid soluble. The phenolic resin is formed by condensation under alkaline conditions. Suitable catalysts are triethanolamine, sodium hydroxide, potassium hydroxide and ammonia. The catalyst is employed in an amount of 1 to 80 4% of the meta-para cresol or other phenol. The phenol-formaldehyde resin is generally used in an amount of 2 to 20% of the polymeric terephthalate ester and preferably in an amount of 6 to 7% of the ester. Example 8 below illustrates a preferred method of forming the phenol-formaldehyde resin while the succeeding examples illustrate the use of such phenolic resins in accordance with the invention.

#### EXAMPLE 8

Meta-para cresol	108 grams
Formalin (37%)	64.8 grams
Triethanolamine	3.24 grams

The mixture was placed into a flask equipped with a stirrer, thermometer, and reflux condenser. The charge was heated until refluxing occurred and the refluxing was continued for a period of 90 minutes. The charge was then cooled to 60°C. and the reflux condenser replaced by a distillation condenser fitted with a flask at the discharge end, so that the entire system could be evacuated. A vacuum of 508 to 660 millimetres of mercury was applied and the charge distilled with the aid of heat until the temperature of the resin in the flask was 80°C. When the resin reached this tempera-

ture, heating and vacuum were discontinued, and a weight of cresylic acid equal to the weight of the resin in the flask was added. This resulted in a 50% solution of the resin in cresylic acid, and was a convenient manner in which to handle the resin.

#### EXAMPLE 9

1000 grams of the final wire enamel prepared in Example 3, having a viscosity of 40 to 60 centipoises, were mixed with 25 grams of the meta-para cresol-formaldehyde resin solution prepared in Example 8, and the mixture applied to #25 copper wire by the free dip method. The resulting wire (after baking at 399 C., as set forth in Example 1) was of excellent quality and required only 6 coats to obtain the same enamel thickness as required 10 coats of the enamel recited in Example 3.

Comparable results are obtained when there is used the final wire enamel for free dip coating of Examples 1, 2, 4, 5 or 6 in place of the wire enamel of Example 3 in carrying out the process of Example 9.

#### EXAMPLE 10

Example 9 was repeated using an amount of the meta-para cresol-formaldehyde resin solution sufficient to give 6.5% of the resin by weight of the polymeric terephthalate ester in the enamel.

#### EXAMPLE 11

Example 9 was repeated but using only enough of the cresol-formaldehyde resin solution to give 2% of the cresol-formaldehyde resin based on the polymeric terephthalate ester.

#### EXAMPLE 12

Example 9 was repeated using sufficient of the cresol-formaldehyde resin solution to give 20% of the resin based on the polymeric terephthalate solution.

The single Figure of the drawing is a cross section of an electrical conductor coated with the novel composition of the present invention.

#### WHAT WE CLAIM IS:-

1. A composition comprising a polymeric ester of terephthalic acid with a polyhydric alcohol consisting of glycerine or pentaerythritol or mixtures of glycerine and pentaerythritol with up to two parts by weight of ethylene glycol per part of said alcohol and a metal drier.
2. A composition as claimed in Claim 1, wherein said polymeric ester has a viscosity between 4000 and 5000 centipoises when measured as a 20% to 40% solution in cresylic acid at 25°C.
3. A composition according to Claim 1 or 2, wherein the metal drier is present in a small amount.
4. A composition according to any one of Claims 1 to 3, wherein the metal is a polyvalent metal.
5. A composition according to any one of

Claims 1 to 4, wherein the metal of the drier is selected from the group consisting of lead, zinc, calcium, and cadmium.

6. A composition according to any one of Claims 1 to 5, wherein the metal drier is 70 a naphthenate.

7. A composition according to any one of Claims 1 to 6, which also contains a phenol-formaldehyde resin.

8. A composition according to Claim 7, 75 wherein the phenol-formaldehyde resin is a cresylic acid soluble resin.

9. A composition according to Claim 7, wherein the phenol used to form the phenol-formaldehyde resin is meta-para cresol.

10. A composition according to Claim 7, wherein the phenol used to form the phenol-formaldehyde resin is cresylic acid.

11. A composition according to Claim 7, wherein the phenol-formaldehyde resin is an 85 alkaline condensed resin wherein the phenol is an alkylated phenol having a total of 7 to 8 carbon atoms and the formaldehyde is used in an amount of 0.7 to 0.95 mols per mol of phenol.

12. A composition according to Claim 7 or 11, wherein the phenol-formaldehyde resin is present in an amount of 2% to 20% based on the weight of the polyester.

13. A composition according to any one of Claims 1 to 12, wherein a cresol is included as a solvent.

14. A composition according to any one of Claims 1 to 12, wherein cresylic acid is included as a solvent.

15. The composition of Claim 14, wherein the solvent includes an effective amount of naphtha up to 60% based on the total of naphtha and cresylic acid.

16. A composition according to any of Claims 1 to 15, wherein the polymeric ester is formed by condensation of dimethyl terephthalate and glycerine in the presence of cresylic acid, there being present in the starting mixture sufficient glycerine to provide 1.0 to 1.6 hydroxyl groups per carboxyl group in the dimethyl terephthalate.

17. A composition according to any one of Claims 1 to 15, wherein the ester is a mixed polymeric ester of terephthalic acid with glycerine and ethylene glycol, there being present up to two parts of ethylene glycol per part of glycerine.

18. A composition according to Claim 17, wherein the polymeric ester is formed by condensation between dimethyl terephthalate, glycerine and glycol in the presence of cresylic acid, there being present in the starting mixture for every 776 parts by weight of dimethyl terephthalate from 100 to 200 parts by weight of ethylene glycol and, correspondingly, from 200 to 100 parts by weight of glycerine.

19. A solution in cresylic acid of a composition according to any one of the pre-

ceding claims suitable as a wire enamel.

20. An enamel for coating electrical wires comprising a cresylic acid solution of a composition according to any one of Claims 1 to 18.

21. An electric wire coated with a continuous coating of a cresylic acid solution of a composition according to any one of Claims 1 to 18, said coating being formed on the wire by baking.

22. A method of preparing a solution of a polymeric polyhydric alcohol ester of terephthalic acid according to Claim 1 comprising heat condensing in the presence of a cresol as a solvent a member of the group consisting of terephthalic acid, terephthaloyl halides and lower alkyl esters of terephthalic acids with a polyhydric alcohol selected from the group consisting of glycerine and pentaerythritol and mixtures of glycerine and pentaerythritol with up to two parts by weight of ethylene glycol per part of said alcohol, and stopping said heating when said polymeric ester has a viscosity of between 4000 and 5000 centipoises when measured as a 20% to 40% solution in cresylic acid at 25°C.

23. A method according to Claim 22, wherein the ester is prepared by condensing in the presence of cresylic acid as a solvent, dimethyl terephthalate with a member of the group consisting of glycerine and mixtures of glycerine with up to two parts by weight of ethylene glycol per part of glycerine.

24. A method according to Claim 22 or 23, wherein the condensation is carried out in one stage to completion.

25. A method according to Claim 23, wherein the condensation is carried out to an intermediate stage, further cresylic acid is added, and the condensation is then continued until the polymeric ester has the viscosity characteristics stated in Claim 22.

26. A method according to Claim 23, wherein the product of condensation is further diluted with cresylic acid and naphtha to give a product having a viscosity between

40 and 5000 centipoises, the amount of naphtha being an effective amount up to 60% based on the total of the cresylic acid and naphtha.

27. A method according to Claim 23, wherein the condensation is carried out to an intermediate stage and then the condensation is continued in a vacuum, without further addition of cresylic acid, until the polymeric ester has the viscosity characteristics stated in Claim 22.

28. A method of preparing an electrical conductor wire for use in electrical equipment comprising coating the conductor wire with a solution in a solvent composed of cresylic acid or mixtures of cresylic acid with up to 60% of naphtha of a polymeric ester of terephthalic acid with a polyhydric alcohol according to any one of Claims 1 to 18, and then baking said film at a temperature sufficiently high to remove the solvent.

29. A method of preparing an electrical conductor for use in electrical equipment characterized by coating the conductor with a solution in a solvent composed of cresylic acid or mixtures of cresylic acid with up to 60% of naphtha of a composition as claimed in any of Claims 1 to 18 and then baking said film at a temperature sufficiently high to remove the solvent.

30. A composition as claimed in any of Claims 1 to 18 substantially as herein described in any of the Examples.

31. A method as claimed in Claim 22 substantially as herein described.

32. An electrical conductor coated with a coating of a composition as claimed in any of Claims 1 to 18.

33. A method of preparing an electrical conductor for use in electrical equipment as herein described including providing a conductor with a coating of a composition as claimed in any of Claims 1 to 18.

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836,004

COMPLETE SPECIFICATION

1 SHEET

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the Original on a reduced scale.*

